STAFF SAFETY DURING ELECTRICAL STORMS

(Refer File AX 7/46)

1. INTRODUCTION

1.1 This EI describes safety rules for staff subjected to electrical storms.

1.2 The appendix to this EI describes some of the properties of electrical storms so that a more informed decision can be made as to the most appropriate action to be taken.

2. SAFETY RULES

DO NOT WORK ON EXTERNAL PLANT WHEN THERE ARE ELECTRICAL STORMS IN CLOSE VICINITY. Staff working on,or near to metallic external plant are generally the most vulnerable to the effects of lightning. Staff on site can best decide if conditions are too hazardous to carry on working. A Supervisor, guided by local knowledge and experience, may decide that work must cease at a remote site because of the danger of thunderstorms. Decisions should be made with discretion. It is not possible to say just when the risk may become serious, but lightning within a few kilometres should be taken as a clear warning to observe safety rules for protection against direct strikes. Lightning could be considered to be within a few kilometres if there is less than 5-10 seconds between lightning and the commencement of the corresponding thunder (see Appendix para 1.2).

2.1 Safety Rules for Protection Against Direct Strikes

Lightning is an electric current and safety rules are designed to avoid contact with that current, or indirect effects from that current.

2.1.1 Seek shelter in a building with at least normal headroom and avoid small sheds or tents.

2.1.2 Motor vehicles offer excellent lightning protection. If You are travelling stay in your vehicle; but slow down or park away from trees. Rain increases the accident risk and a driver's attention may be diverted by the storm. If driving is continued watch for and avoid fallen trees, washaways, etc.

2.1.3 If no buildings or motor vehicles are available seek protection of a cave, ditch, canyon, etc. Avoid highest objects in the area. If only isolated trees are available, the best protection is to crouch in the open keeping at least twice as far away from isolated trees as the trees are high. If on open ground and away from shelter, squat

2.1.3 (Contd.)

down singly with feet together. Footwear or a layer of insulating material offers some protection against ground currents should there be a nearby flash.

2.1.4 Avoid contact with all metal objects. STOP WORK ON, AND KEEP CLEAR OF OPEN WIRE, RADIO ANTENNAE, CABLES, MDF's, TOWERS AND MASTS. If in a building or vehicle do not lean against the walls, or side nor touch metal objects such as window frames, door frames, sinks, electrical appliances etc. Out of doors, avoid contact with metallic fences, pipelines or structural steel febrication.

2.1.5 ALL WORK ASSOCIATED WITH EXPLOSIVES, ESPECIALLY ELECTRIC DETONATORS, MUST CEASE.

2.1.6 If using the telephone, keep clear of electrical appliances, for example, stoves and refrigerators and other metal fixtures such as window frames or sinks. By following this rule and keeping calls brief, the possibility of receiving a discomforting electric or acoustic shock will be extremely unlikely. Usage of radio communication equipment such as mobile radios should also be kept to a minimum during storms.

2.1.7 Radio antennae are likely to be affected by electrical storms and staff should take precautions when working on or near antennae, as noted in para. 2.1.4. In addition precautions should be taken when working on equipment connected to antennae.

2.1.8 Get out of the water and off small boats. A water environment is more dangerous than on land.

2.1.9 Stop tractor work if no metal canopy is fitted. Do not ride bicycles or any open vehicle.

2.2 Rules for Protection Against Remote Electrical Storms

The safety of a workplace associated with external plant can be affected by remote electrical storms or unseen atmospheric effects etc. The following rules apply.

2.2.1 Metal objects such as exposed metallic cable sheaths, repeater housings, metal conduits etc. can present a hazard from remote lightning when working on underground plant. Unnecessary contact should be avoided. If contact is necessary, effective earthing of the item to be touched must be assured. If the lead sheath is to be removed (e.g. for jointing) it is essential that the electrical continuity of the sheaths be maintained to

2.2.1 (Contd.)

protect the jointer against a shock from a remote strike. Bonding of the sheaths to a local earth via a single earth stake would give added protection.

Some cable systems have the cable sheath and repeater housings intentionally isolated from earth (floating). When working on the systems temporary earths are fitted. Work must not be performed on the cable or equipment while lightning risk remains. Also, after work is suspended (because of lightning) temporary earths are to be removed.

If you are not sure as to whether or not a cable system is intentionally isolated from earth (floating) consult your Supervisor.

2.2.2 An aerial circuit which is not in use, may be 'open circuited' and not protected. It may become electrically charged and potentially dangerous. The source of this charge may be obvious and come from an electrical storm. Voltages may also appear on these lines before storms are formed. If an electrical storm has been in the area, or there is suspicion that the lines may be charged, BEFORE ANY LINEMAN CLIMBS A POLE ALWAYS DISCHARGE THE LINES BY contacting each aerial wire in turn with an 'earthed' wire which should be held in a pole pike or on a length of dry timber.

2.2.3 Spare unearthed conductors in plastic insulated cables may infrequently cause a discomforting electric shock after storms have been in the area. The electrical shock may be avoided by earthing these conductors before touching. The electric charge is most likely to arise on long lengths of cables in high resistivity soil areas (e.g. sand) and particularly after storms. The electric charge may also arise as a result of meggering or after installation of the cable by mole plough. Unless discharged to earth, the charge may be retained on the conductors for several days.

2.2.4 Work should cease if shocks are received. The situation should then be carefully considered. If the above rules are not applicable and the shocks could not have come from fallen power lines, but from very remote electrical storms, considerations could be given to resuming work but using insulated mats (S33/54) and rubber gloves (S34/14-21) as necessary. An electrical shock may be only minor, but could cause serious secondary effects if it were to cause a fall, or some other accident.

3. CAUTION AFTER STORMS

Where power lines are present, an inspection for electrical contacts should be made before work is resumed after electrical storms. Refer EI LINES, Cables, SP9230 for further details.

4. FIRST AID TREATMENT

Persons struck by lightning receive a severe electrical shock and may be burned. An unconscious person should be checked to see whether the heart is beating or the breathing is present. If not cardiac massage and/or mouth to mouth resuscitation should be immediately applied. Such action, together with other appropriate first aid treatment, should prevent death from lightning. For further information on resuscitation see EI LINES, General SP 9000.

5. CONCLUSION

Electrical storms can seriously affect the safety of staff. Electrical storms should be treated with respect. Care and discretion is to be used when determining what action should be taken.

END

APPENDIX 'A'

SOME PROPERTIES OF ELECTRICAL STORMS

1.1 An electrical storm or a thunderstorm is a convective storm and can be described as a combination of thunder and lightning with or without rain. It is always associated with cumulonimbus clouds usually rising to more than 3Km and often having an anvil shaped top. The intensities of an electrical storm are described as:-

a. Slight, isolated thunder

b. Moderate, frequent thunder

c. Heavy, almost continuous thunder

1.2 The distance to a lightning strike in kilometres can be estimated by counting the number of seconds between lightning and thunder and dividing by three. For example if 5 seconds are counted between a flash of lightning and its associated thunder, the distance to the flash is just under 2Km. When lightning is close by, the thunder is a sharp explosive sound. More distant strokes produce a growl or rumble.

1.3 Lightning occurs when the build-up of electrical potential in the atmosphere becomes great enough to ionise the air. Over land and beneath storms, the voltage potential gradient seldom exceeds 100V/cm. Potentials in the atmosphere may be as high as 100 million volts and peak current as high as 200,000 amperes. Lightning flashes occur more frequently within a cloud and from cloud to cloud than from cloud to the land surface.

1.4 If thunder can be heard, lightning must be present. In general thunder cannot be heard more than 8-10Km from the source because of dispersion caused by the atmosphere. However under certain conditions, thunder may be heard a t a distance of 15-25Km.

1.5 Lightning can be seen at night up to distances of 200Km or more. Lightning close to the observer may not be visible because of clouds or other obstructions.

1.6 An isolated electrical storm may be only 3-5Km across. Clusters of electrical storms about 30 to 80Km across are common. Lines of clusters may be several hundred kilometres in length.

1.7 The transition from a small cloud to a turbulent, electrical storm can occur in as little as 30 minutes. The speed of movement of an electrical storm is dependent on wind speeds in the upper atmosphere.

1.8 If static is heard on a radio receiver, this is an indication of

APPENDIX 'A' (Contd.)

1.8 (Contd.)

lightning activity. The loudness and frequency of the static will give some indication of the closeness and intensity of the lightning. If thunder can also be heard, then the time between the associated static and thunder can be used to calculate the distance to a lightning strike as in paragraph 1.2 above.

1.9 The severest electrical storm may cause telephone plant to reach potentials of up to 100,000 volts. High energies are present for the first few tens of micro-seconds after breakdown. These high potentials will disperse in a very short distance. Typical insulation of telephone plant is able to withstand no more than several thousand volts. Protection equipment is designed to operate typically at 230 volts or lower.

2. REFERENCES

The Standards Association of Australia has published an Australian Standard (AS1768) which mainly provides guidance on how protection against damage from lightning strikes can be given to buildings and property. A pamphlet (Consumer Leaflet No. 3 May 1977) gives general guidelines on how people can help themselves from being struck by lightning. This pamphlet is suitable for display on notice boards. As considered desirable or necessary Section or District Offices should arrange for copies to be obtained and displayed on notice boards. Consumer Leaflet No. 3 is available free from:-

Standards Association of Australia
11 Bagot Street
NORTH ADELAIDE S A 5006

Telephone: 08 267 1757.

END